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SOIL BASED TESTING FERTIGATION SYSTEM

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Abstract: Agriculture is the main trade of our country and it plays an important role in our country. No of people in India depends on only farming so agriculture with production with quality is a requirement of present and future. Using an extra quantity of fertilizers may cause lower quality of crop production and also affect the quantity of crops. So, the correct quantity of soil nutrients is mainly required for the best plant growth. Correct and required fertilizers give a high production rate with better quantity. Calculating the number of nutrients in the soil is the most vital function. Quantity of nutrients is also one of the necessary and it is helpful soil parameters to unrip the soil fertility and it is measured or calculated to recognize the soil fertility.
In the proposed system, it decides the nutrients which are suitable for the particular soil with presently available percentage nutrients. This process plays the most important role. The system will interpret nutrients content in the soil in real-time. This system is basically helping the farmers also for nurseries. As for growth and take advantage of available nutrients from the soil rather than using irrespective quantities of nutrients. The system will suggest only required fertilizers, it is helpful for crops and soil also.

Index Terms **- Farming, Fertilizer, Soil, Fertigation, Nutrients, Nitrogen, Phosphorus, Potassium.**

I. INTRODUCTION

India is a demesne of adaptable soils. In our country economy is generally based on agriculture and the agricultural quality of production depends upon the variety of soil. But the vital problem related to the Indian farmers is the deficiency of adequate knowledge about their soil and fertility of the soil. Each soil type has diverse characteristics and features. There are multiple nutrients present in the soil. Lack of nutrients to slump in productivity and rate of production. So, there is a major requirement in soil evaluation and analysis. The awfully situation of farmers suicide and the silence on the same. Now this time to lead the conception to put the efforts in the development and design of an enlightened soil testing and fertilizer recommendation system. The system will be helpful for all farmers to increase the quality of production. the system will be used for soil scrutiny in order to boost crop yield. Soil analysis is done through sensors and various IoT devices. Based on soil analysis and nutrients measurement required fertilizer will be recommended to the user. Fertilizer will be recommended using a big set of predefined datasets. Dataset contents nutrient status of various types of soli that are stored in the database. The next procedure comparing and analyzing values of nutrients with table classification will be done. Further step required fertilizer will be recommended to the user for a particular soil. Our system very helpful for farmers using this system farmers will get the best crop yield which in turn maximizes profit and quality of production.

II. LITERATURE REVIEW

Existing System:

The existing system uses two methods for testing soil for fertilizer recommendation.

1. Laboratory testing
2. Mobile through soil testing for soli nutrients

The first method of testing involves soil testing which requires more time, and it is a long-winded process. It takes weeks or the minimum number of days to test soil fertility. This testing involves taking the soil paradigm and send that to the chemistry laboratory for soil testing and analysis. This process will be done using chemical analysis, they discover the NPK rate of the soil.

The second method is mobile soil testing, it involves chemists. Those who come and perform the soil analysis and examine then give the solution concerning the required fertilizer, but it will be complete once in a crop. This testing is not appropriate to get productive crop production and production rate. This method will not give the correct outcome. The next method of testing for discovering the fertility of the soil is using conductive and microelectronic detector methods. But this method is an expensive and correct outcome for fertilizer recommendation are not effective.

Articles from International peer-reviewed journals: Rajeshwari Khubchandani et al. [1] have explained how their system helps out to enhance the productivity of crops by obtaining a high-speed outcome of quality of the soil. Komal Bodake et al. [2] have explained about Soil-based Fertilizer Recommendation System using Internet of Things and the main target of this work is to build a soil-based fertilizer recommendations system will apply for local soil survey this will be discovered to be the farmhand to encourage along with turn out right crop. Dr. T. Kavitha et al. [3] have explained how their system will examine nutritive content available in soil in actuality along with recommending fertilizers depend on examined soil. P. Sindhu et al. [4] have explained how it will determine the fertilizers which are suitable soil, also how it will analyze NPK contents present in the soil in actual along with recommending fertilizers depend on examined nutrients in the soil.

III. METHODOLOGY

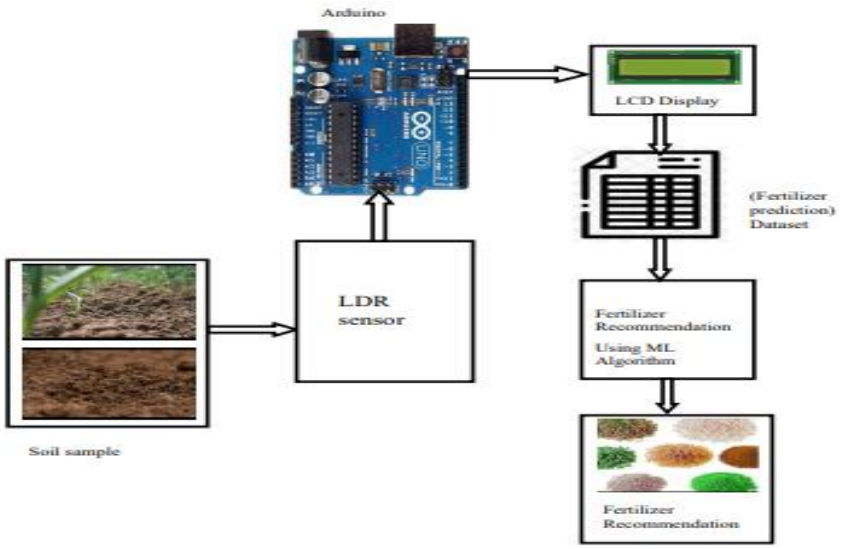

Figure 1. System Architecture

The proposed solution will be based on the Internet of Things. There are two parts to the Solution such as identify nutrients present in the soil and recommend required fertilizer for tested soil. The fertilizer recommendation system is based on the identified quantity of present nutrients in the soil using sensors and then recommends the required fertilizer. The conventional farming methods were replaced by the automatic remotely fertilizer recommendations system.

Using this system farmers will get present nutrients of soil on the display screen. Here sensors are used to get the present quantity of nutrients in the soil. To get the equities percentage of the nutrient's contents from the soil. The outcomes of each test are taken then averaged and displayed on the screen. The next step machine learning model is trained and tested using a predefined dataset. A further step is to identify NPK contents used as input for the machine learning model. Finally, the model will recommend the required fertilizer for the tested soil. The solution includes the following phases:

A. Soil testing:

In the first phase testing of soil is done. The system will check the given soil for the further process that is nutrients analyzing. Soil testing is one vital phase in this system. The system will analyze presently available nutrients in the soil. Using sensors and other IoT devices. This phased process will complete, then proceed to the next phase.

B. Analysing nutrients:

The second phase will analyze nutrients contents present in the soil. In this phase, the system will analyze nutrients contents from the soil and give them in percentage on the display screen. The display screen shows nutrients contents in a percentage format. Contents are NPK values that are N= Nitrogen, P= Phosphorus, and K= Potassium. These values are used for the further phase.

C. Compare quantity of nutrients:

In this phase comparing the quantity of the nutrients present in the tested soil is done. This can be done using a machine learning model. Using the present quantities of nutrients model will decide which nutrient is lagging, then find out which nutrient wants to increase. There are multiple models of machine learning. Here we used the Random Forest regression model. Comparing the quantities will be done using a predefined standard dataset. Here we used the fertilizers prediction dataset. This dataset contains N number of NPK contents of a variety of soils. Using these values machine learning model is trained and tested for the proposed system.

D. Fertilizer recommendation:

In the fertilizer, recommendation phase the correct required fertilizer will be recommended. Using the machine learning model this process will be done. The Random Forest Regression model is a classification model. This model made several decision trees during the training and used for supervised learning algorithms. Supervised means it uses a labeled dataset to train the algorithms. The Random Forest Regression model is used to predict the outcome accurately. In our system outcome is the prediction of the correct required fertilizer.

E. System performance analyzing:

The last phase contains a performance analysis of the system. In this phase, we analyze the working of the system, whether the system is recommending the correct fertilizer or not. Also, check the accuracy of the proposed system is done in this phase.

IV. EXPERIMENTS, RESULTS AND DISCUSSION

On comparison between Linear regression and Random Forest regression (RFR) from the conducted study for fertilizer recommendation using fertilizer prediction.csv dataset. It was observed that Random Forest Regression gives better accuracy while testing in real conditions. Linear regression gives near about 90% accuracy while using Random Forest Regression (RFR) recorded 98% accuracy while training but testing in real-time scenarios, moisture of soil, and other factors affect the accuracy. But it was better than the linear regression model.

The Result analysis for Random Forest Algorithm with some sample values nutrients and predicted fertilizer is shown in the below table.

Table 1. Predicted Fertilizer

Sr. No	Nitrogen	Phosphorus	Potassium	Recommended Fertilizer
1	37	0	0	Urea
2	12	0	36	DAP
3	7	9	30	14-35-14
4	24	0	22	28-28
5	15	14	11	17-17-17
6	13	0	13	20-20

V. PERFORMANCE ANALYSIS

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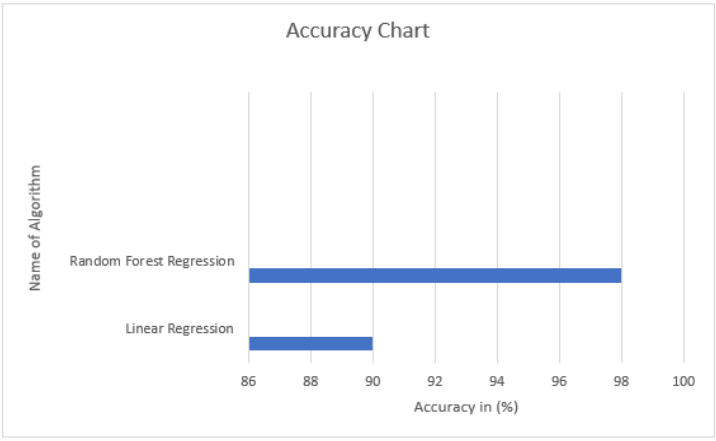

Figure 2. Accuracy Chart

VI. FUTURE WORK

The implemented proposed system predicts the fertilizer for the soil based on NPK values. In the future it may extend to predict or identify the predicted fertilizer is suitable or not for the tested soil. Also proposed system may integrate with application. Through application user directly put NPK values and get correct required fertilizer.

VII. CONCLUSION

The proposed methodology for advanced farming using the technique Internet of Things with machine learning mode. With the use of this system farmers or users will be able to get details regarding required fertilizers for the tested soil. This system is used for improving crop productivity and rate of production with the reduction in the cost of fertilizer. Using remote-based system farmers will get accurate results with less effort. This will be done using linear regression gives near about 90% accuracy while Random Forest Regression gives 98% accuracy.

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